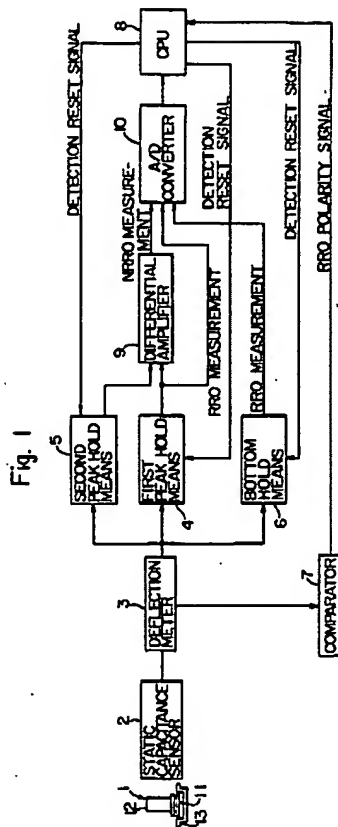


Nov. 13, 1994

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FIGS. 7-A and 7-B are diagrams showing an input signal and an output signal of the first shift means respectively when the input signal is negative;

FIG. 9 is a schematic view showing a mechanism of installation of a sensor.

DETAILED DESCRIPTION:

(1) DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

(2) A motor eccentricity measuring apparatus according to a first embodiment of the present invention will be described referring to FIGS. 1 and 2.

(3) As shown in FIG. 1, a spindle motor 1 to be examined is provided with a bracket 11 and a hub 12 arranged for rotation relative to the bracket 11. Also, a bearing member (not shown) is mounted on the bracket 11 so that it can rotate together with the hub 12. The hub 12 is coupled to a recording medium, e.g. a magnetic disk, by a known manner.

(4) First, the spindle motor 1 which has fully been assembled is carried on a transfer table 13 to a measuring station where a static capacitance sensor 2 is installed for measurement of a distance to the hub 12 of the motor 1. The sensor 2 is arranged for detecting a change in the distance to the surface of the hub 12 and translating it to a capacitance variation which is then delivered as a voltage output of measurement to a deflection meter 3.

(5) The deflection meter 3 calculates a shaft runout of the motor from the voltage measurement of the static capacitance sensor 2 and then, transfers it to two, first and second, peak hold means 4 and 5 and a bottom hold means 6. Also, a comparator 7 is provided for producing a square wave corresponding to a deflecting direction signal of the deflection meter 3 and transmitting it to a CPU 8 which may be a microprocessor. In response to the square wave of the comparator 7, the CPU 8 delivers a detect/reset signal to the two peak hold means 4 and 5

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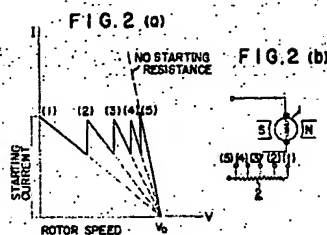
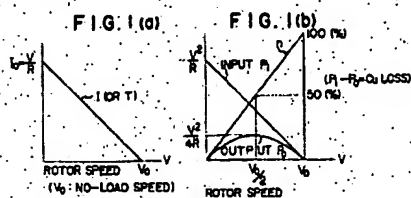
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KIYO TAKEYASU

3.465.224

ACQUIESCENCE DIRECT-CURRENT M0003

Filed Aug. 30, 1963

5. உள்ளக-உறவு :



INVENTOR:

-Kiyoo Takayanagi

Dr. Edward M. ...

US-PAT-NO:

3465224

DOCUMENT-IDENTIFIER: US 3465224 A

TITLE:

BRUSHLESS DIRECT-CURRENT MOTOR

OCR Scanned Text - LPAR (7):

3,465,224 3 Furthermore, a feature of a D-C shunt motor is that, by taking its rated speed in the neighborhood of its no-load speed, the speed-d fli-ictation is kept low, and the efficiency is caused to be high. Accordingly, the motor is so designed that the rated speed approaches its no-load speed as much as possible to obtain sufficient mechanical output. It is apparent from the above two points that if the power source voltage V were applied to the motor at starting, not only would a great load be imposed on the power source, but there would arise the risk of heat or 10 burning damage to the armature winding. For this reason, it is the ordinary practice, as indicated in FIGS. 2(a) and 2(b), to start a motor 1 as the armature current is prevented from exceeding a certain value by using a series resistance 2 at the time of starting and to short-circuit this 15 resistance after the rated speed has been reached. That is, in a D-C shunt motor, it is desirable that limiting of the current be accomplished by causing the resistance value of the armature winding to be high at the time of starting, to decrease as the speed increases, and to become 20 come a specific value at the rated speed. As is further known, the operational principle of a brushless D-C motor of the type wherein the rotor position is detected, and the rotation is maintained by switching the polarity or the magnitude of the armature current in 25 accordance with the detected rotor position, such as, for example, a brushless D-C motor in which a Hall generator is used as the rotor position detector, is the same as the operational principle of a D-C shunt motor. Accordingly, the various characteristics of a brushless motor of this 30 type are also similar to those of the motor in the case illustrated in FIG. 1. The principle of one example of a conventional brushless D-C motor of this type in which a Hall generator is used is indicated in FIG. 3. Rotation of a magnet rotor 3 35 causes a current and a speed E.M.F. E to be produced in an armature winding 4, the speed E.M.F. E becomes large in proportion to the rotational speed. The bias voltage between the collectors and emitters of transistors Ti-1 40 and Tr2 becomes V-E and is in inverse proportion to the speed. On the other hand, the output of a Hall generator 5 which is the base input is constant irrespective of the rotational speed. Accordingly, the following equation, which is the same as Equation 1, is obtained. $45 I = V - E$ where R is the armature resistance. That is, the characteristics of a brushless D-C motor in which a Hall generator is used as a rotor

Details Text Image HTML KWIC

37	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 3652909 A	19720328		RELUCTANCE MOTORS AND BRUSHLESS STEPPING MOTOR	318/
38	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 3643118 A	19720215		ROTARY MACHINE	310/
39	<input type="checkbox"/>	<input type="checkbox"/>	US 3465224 A	19690902	9	BRUSHLESS DIRECT-CURRENT MOTOR	318/

 Details
 Text
 Image
 HTML

PATENTED MAR 28 1972

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SHEET 1 OF 2

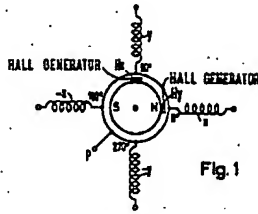


Fig. 1

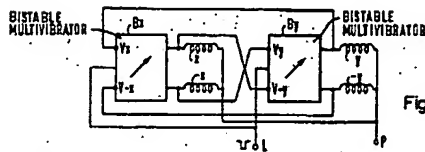


Fig. 2

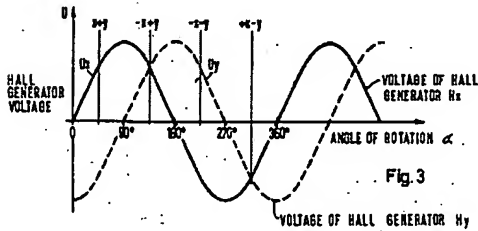


Fig. 3

US-PAT-NO: 3652909
DOCUMENT-IDENTIFIER: US 3652909 A
TITLE: BRUSHLESS STEPPING MOTOR

Drawing Description Text - DRTX (4):

FIG. 3 is a graphical presentation of the voltages provided by the Hall generators in accordance with the instantaneous rotor position; and

Detailed Description Text - DETX (19):

The individual switching transistors T1, T2, T3 and T4 are cyclically controlled by four capacitors C1, C2, C3 and C4. The capacitors C1 and C2 are connected to each other, the capacitors C3 and C4 are connected to each other and a common point in the connection of each is directly connected to the other. The capacitors C1 to C4 are cyclically controlled via a resistor R17 connected to the positive polarity terminal of the source of current. The electrode of the capacitor C1 which is not connected in common with the other capacitors is connected to the switching input Vx of the flip flop Bx. The electrode of the capacitor C2 which is not connected to the other capacitors is connected to the switching input V-y of the flip flop Bx. The electrode of the capacitor C3 which is not connected to the other capacitors is connected to the switching input Vy of the flip flop By. The electrode of the capacitor C4 which is not connected to the other capacitors is connected to the switching input V-y of the flip flop By. The switching input Vx is connected to the positive polarity terminal P of the current source via a resistor R18. The switching input V-x is connected to the positive polarity terminal P of the current source via a resistor R19. The switching input Vy is connected to the positive polarity terminal P of the current source via a resistor R20. The switching input V-y is connected to the positive polarity terminal P of the current source via a resistor R21. The switching input Vx is coupled to the base electrode of the transistor T1 via a diode D1. The switching input V-x is coupled to the base electrode of the transistor T2 via a diode D2. The switching input Vy is coupled to the base electrode of the transistor T3 via a diode D3. The switching input V-y is coupled to the base electrode of the transistor T4 via a diode D4.

Detailed Description Text - DETX (20):

Details	Text	Image	HTML	KWIC	
37	US 3652909 A	19720328	6	RELUCTANCE MOTORS AND BRUSHLESS STEPPING MOTOR	318/
38	US 3643118 A	19720215	14	ROTARY MACHINE	310/
39	US 3465224 A	19690902	9	BRUSHLESS DIRECT-CURRENT MOTOR	318/

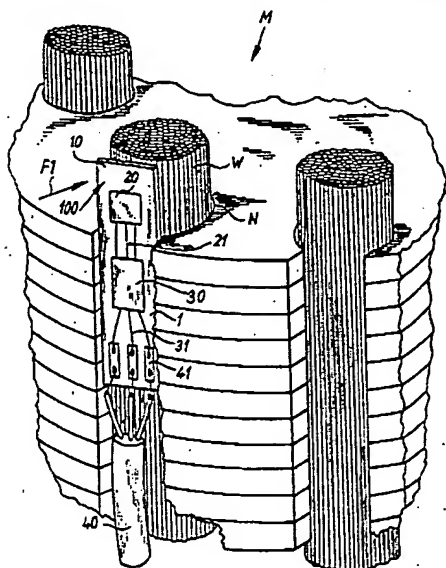


Fig. 1

US-PAT-NO: 4734603
DOCUMENT-IDENTIFIER: US 4734603 A
TITLE: Motor control mounting

Brief Summary Text - BSTX (13):

The main advantage of this arrangement is that it provides a space-saving means of locating the Hall generator in the stator in the upper part of the rotor housing of a motor provided with an external rotor. In this area, the permanent magnet field is very strong, whereas the stray field will be very weak, and the arrangement is almost completely protected against outside influences.

Detailed Description Text - DETX (3):

The supply and output leads from the amplifier are run in bonding wiring 31 to the solder support points 41, to which can be connected the power leads 40 from the power supply (not shown) and from a capacitor as well, if needed.

Details	Text	Image	HTML	KWIC
19	<input type="checkbox"/>	<input type="checkbox"/>	US RE34609 E	19940517 21 physical parameter
20	<input type="checkbox"/>	<input type="checkbox"/>	US 4804892 A	19890214 19 Collectorless direct current motor circuit for a drive and method of
21	<input type="checkbox"/>	<input type="checkbox"/>	US 4734603 A	19880329 5 Collectorless direct current motor circuit for a drive and method of
22	<input type="checkbox"/>	<input type="checkbox"/>	US 4644157 A	19870217 18 Motor control mounting
	<input type="checkbox"/>	<input type="checkbox"/>	US 4644157 A	19870217 18 Optical rotation detecting apparatus

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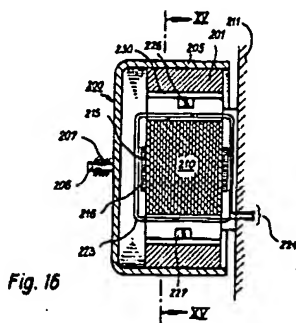


Fig. 16

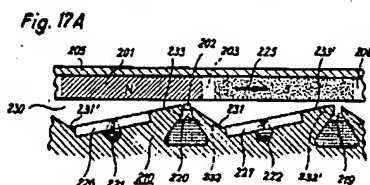


Fig. 17A

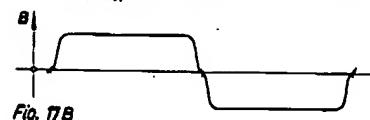


Fig. 17B

US-PAT-NO: 3891905
DOCUMENT-IDENTIFIER: US 3891905 A
TITLE: Brushless d-c motor

Abstract Text - ABTX (1):

A transducer, such as a Hall generator is located on the stator to control a semiconductor switching element, such as a transistor, in series with the winding of the motor to pulse the winding and generate a driving torque which interacts with the magnets of a permanent magnet rotor. The stator has located thereon a permanent magnet arrangement, for example a single permanent magnet or a plurality which is positioned to generate, together with angular position selective reluctance torque generating means, an additional driving torque in those angular ranges of position of the rotor during which no driving torque is supplied by the pulsed winding, so that the overall torque being applied to the motor, during a revolution of the rotor, is essentially free from gaps. The permanent magnet on the stator is preferably so located that a portion thereof is outside of the rotor field to decrease demagnetizing effects.

Brief Summary Text - BSTX (2):

The present invention relates to a brushless d-c motor having a permanent magnet (PM) rotor, and a transducer element, such as a Hall generator on the stator to control current flow through the motor winding in dependence on the instantaneous angular position of the rotor with respect to the transducer element, that is, with respect to the stator and the winding thereon.

Detailed Description Text - DETX (20):

Rotor 26 will reach a position in which the poles of the magnet 27 will be opposite equal poles of the rotor, after the quarter revolution above described. The rotor will continue to rotate out of this position and will receive a drive torque 64 (FIG. 12, graph b) which overcomes the gap in the electrical torque M.sub.el seen at 65 in graph a of FIG. 12 and, further, the braking torque due to the elements 45, 46. This torque seen at 64 will be effective for approximately a further quarter revolution

Details	Text	Image	HTML	KWIC
29	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 3940670 A 19760224 9 Speed control apparatus for a D.C. having hall generators
30	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 3898544 A 19750805 11 DC brushless motor
31	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 3891905 A 19750624 21 Brushless d-c motor
32	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 3873897 A 19750325 11 Collector-less D-C motor

US-PAT-NO: 5798623
 DOCUMENT- US 5798623 A
 IDENTIFIER:
 TITLE: Switch mode sine wave driver for polyphase brushless permanent magnet motor

Abstract Text - ABTX (1):

A switch mode sine wave driver circuit selectively sources and sinks driving currents to and from a DC brushless motor in accordance with the substantially sinusoidal switched driving signals. A signal waveform monitoring circuit monitors electrical signals appearing the motor windings and puts out motor phase reference signals. A phase clock generator provides a motor -synchronized clock signal. A phase counter is clocked by the motor clock signal and is reset by the motor phase reference signals. The phase counter counts predetermined phase intervals and generates phase counts and phase polarity signals. A motor state decoder responds to the phase polarity signals by generating state control signals. Sine wave logic circuitry is addressed by the phase counts and puts out digital polyphase sine values for each one of the polyphases. A polyphase pulse width modulator circuit responds to the polyphase sine values by generating phase pulses having duty cycle duration controlled by the sine values. A logic decoder responds to the state control signals by decoding the phase pulses into phase driving pulses and by supplying the phase driving pulses to control a polyphase motor driver bridge circuit in order to rotate the motor.

Brief Summary Text - BSTX (2):

The present invention relates to electronic circuits for driving polyphase brushless permanent magnet motors. More particularly, the present invention relates to a switch mode sine wave driver circuit for driving a brushless permanent magnet motor, such as a spindle motor for a disk drive, with switched positive and negative (full wave) sine wave excitation resulting in significantly lowered electrical and acoustical noise emanating from the motor and in a manner enabling simultaneous precise regulation of motor speed.

Brief Summary Text - BSTX (4):

It is known to employ electronically commutated DC brushless permanent

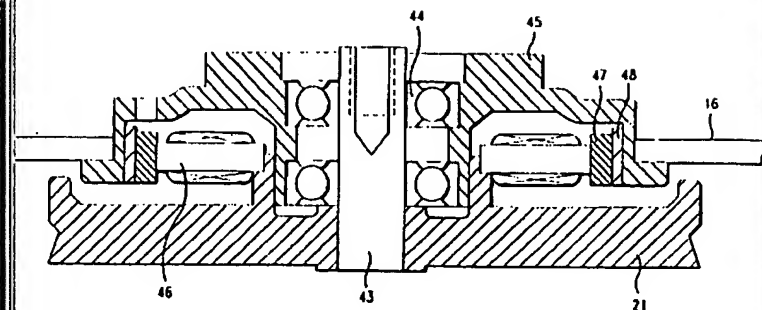


FIG. -2

Details	Text	Image	HTML	KWIC	
9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 6172474 B1 20010109 58	source modulation for Motor with electronic distributing configuration 318/
10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 5798623 A 19980825 21	Switch mode sine wave driver 318/ for polyphase brushless
11	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 5796231 A 19980818 35	Rotation position detecting 318/ device and motor device